**Objectives**

Upon completion of this activity, you will be able to:

* Identify positive and negative feedback systems
* Describe how feedback systems impact global climate change

**Causal Principles**

1. Gravitational energy, thermal energy and/or chemical **energy** drive all movement and change of matter on Earth.

2. A system is in **equilibrium** when energy in the system is balanced.

3. Matter moves and changes to return a system to **equilibrium.**

8. **Feedback loops** can accelerate, decelerate, or dampen change.

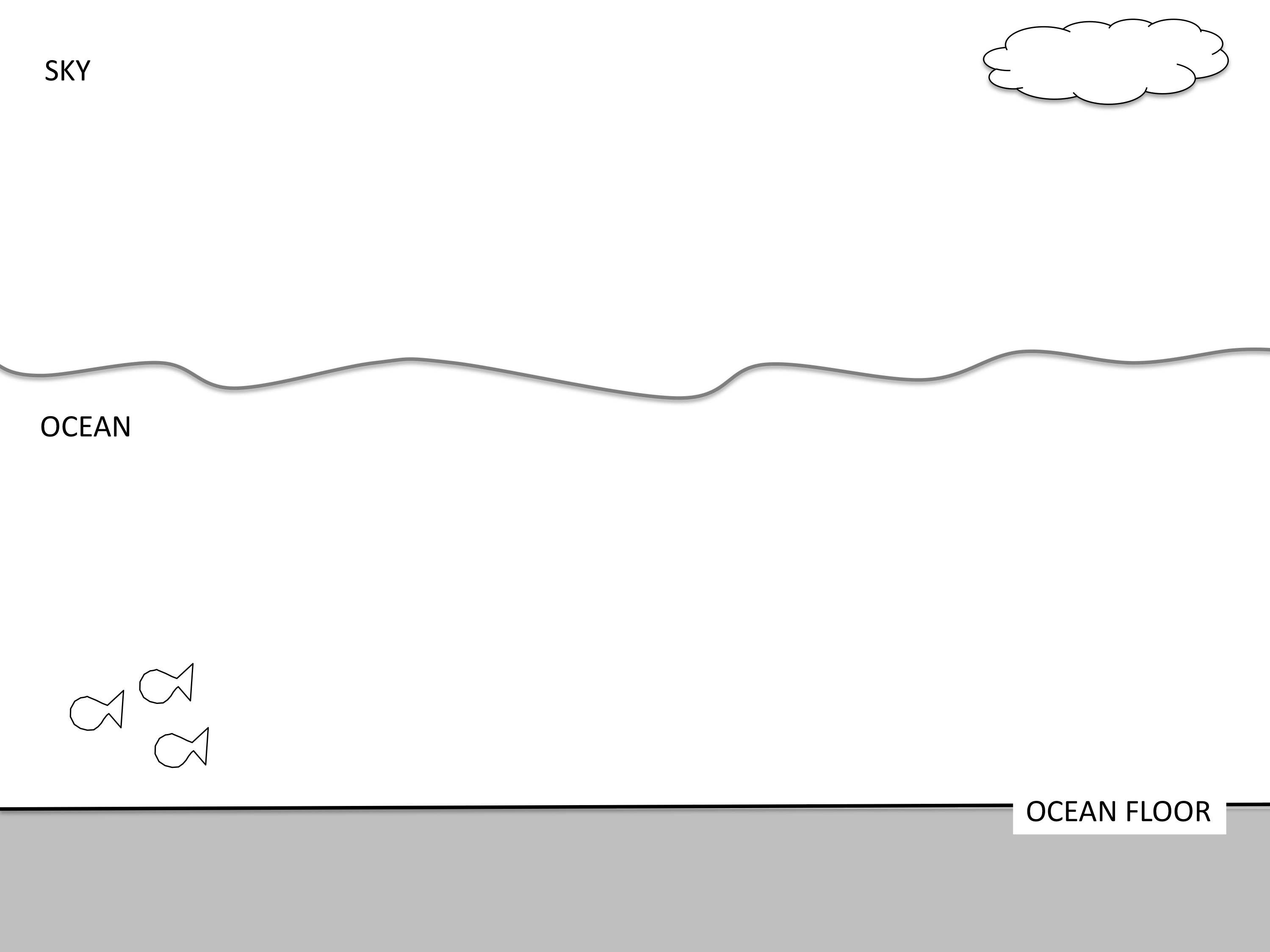
**PART 1: Background Notes**

**Part 2: Group Work**

On the diagram, label the steps for how global warming and permafrost have a positive feedback loop.



On the diagram below draw in a negative feedback loop involving increasing cloud cover and the atmospheric temperature.



**Questions**

1. Why is the permafrost / global warming cycle considered a positive feedback loop?
2. Why is the cloud cover system a negative feedback loop?
3. Use the principles in the introduction to label the underlying cause for the changes in each feedback system.

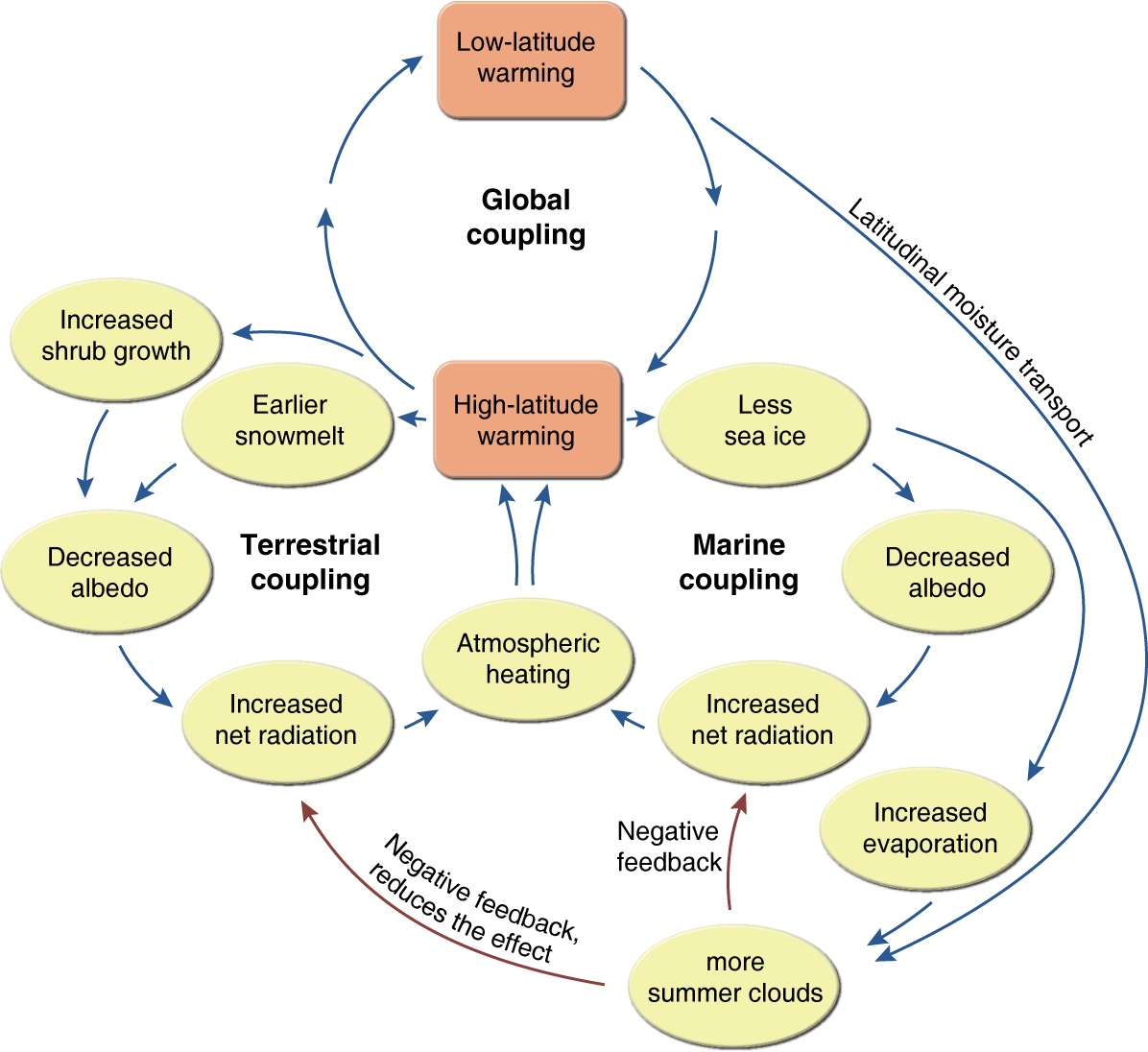
**Albedo:**

When light hits a reflective surface, the energy does not get absorbed. On Earth, the water and soil covered surfaces absorb the Sun’s radiation and convert it to heat. Glaciers and ice sheets reflect the Sun’s radiation. If there is more ice, more of the Sun’s radiation gets reflected back to space. If there is less ice, more of the Sun’s radiation gets absorbed by the Earth’s surface and is converted to heat in the atmosphere.

1. If global warming causes the loss of glaciers and ice sheets, would this result in a negative or positive feedback loop?

On the diagram below, label the negative and positive feedback loops.

\*\*EDIT and remove neg loop\*\*

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<http://www.unep.org/geo/ice_snow>

1. Pick a negative feedback loop and explain how it brings the system closer to equilibrium.
2. Pick a positive feedback loop and explain how it amplifies the system.

**Part 3: Homework**

If you complete the group work, you may work on the homework **on your own.** This means your answers should be generally unique from other students’ answers. **Submit your homework using ANGEL**.

The following mechanisms have caused the climate to change in the past. Identify if these will cause **global warming, cooling, or neither**, explain **why** and identify whether they are examples of **positive or negative feedback loops** for the climate system:

**Aerosols**

Large volcanic eruptions can eject ash in the upper atmosphere. This can remain for many months blocking the incoming solar radiation.

**Rainforest**

Cutting down large portions of the forests on Earth kills living plants that remove CO2 from the atmosphere through respiration.

**Permafrost**

Melting of permafrost will release methane gas, a greenhouse gas.